

Department Of Labor and Industry (DLI)
Division of Voluntary Apprenticeship

Administrators/Instructors Manual

Youth Apprenticeship Safety Training Program

This material is available to you in different forms — large print, Braille or audiotape — if you call (651) 284-5090 (general information) or TTY (651) 297-4198 and request the service.

April 1, 1999

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Installation Instructions

System Requirements

Personal computer using a 486/100MHz or higher 32-bit microprocessor, 8MB of memory and 10MB of free Hard Disk storage running Microsoft Windows 95, 98, 2000 or NT.

(For assistance, call the Minnesota Department Of Labor And Industry, Division Of Voluntary Apprenticeship at 651-296-2371 or 1-800-657-3607.)

Floppy Disk Setup Instructions

1. Close any open *Microsoft Windows* applications
2. Insert the Setup Disk into Drive A.
3. From Program Manager, select *FILE* and Choose *RUN*
Or
Click File Menu (*Start Button* in Windows Task Bar)
4. Type A:\SETUP and Press *ENTER*.
5. Follow the installation instructions displayed on the screen. If prompted, reboot the computer to complete the process.

CD-ROM Setup Instructions

1. Close any open *Microsoft Windows* applications
2. Insert the CD into the CD-ROM Drive.
3. Autorun should automatically start installation
or
Click File Menu (*Start Button* in Windows Task Bar)
and
Type <CD-ROM drive letter>\SETUP and Press *ENTER*.
4. Follow the installation instructions displayed on the screen. If prompted, reboot the computer to complete the process.

NOTE: For CD-ROM users, after the program has been installed, a complete copy of the Student Manual has also been provided, called YOUTHSTU.PDF. To display or print this manual, simply double-click the Icon within your Microsoft Windows Explorer pointing to your CD-ROM directory.

Starting The Youth Apprenticeship Safety Training Program

After successful installation:

1. Double-click on the *Youth Safety Icon* that was placed on your Windows desktop.
2. As a new user, leave the 'Add New Name' box as is and Press the *REGISTER* button.
3. Enter your full name and your personal *PASSWORD*.
4. To begin the Self-Study, select *Lessons* from the *Main Menu* and highlight the first lesson.
5. To take a test, select *Take Test* from the *Main Menu*, depress the appropriate Option Button and then Press the *Take Lesson Test* Button.
6. The program will remember each Lesson and Test Answer when you press the *SAVE* or *PRINT TEST RESULTS* Button.

Instructions To UnInstall The Program

To remove the Youth Apprenticeship Safety Training Program from your computer:

1. Open *Microsoft Windows Explorer*
2. Locate the file Icon named UNWISE.EXE in the directory that you installed the program (default was C:\OSHA\)
3. Double-click the *UNWISE* Icon to begin the UnInstall process.
All files and programs will be removed, include the *Adobe Acrobat Reader* that was installed with this program.

Manual Overview

Our youth are important to us! We don't want them to get hurt. That's why we have created this basic safety information. We want them to understand how to stay safe before they are given a job. This helps prevent them from getting hurt when they do their job.

There are eight Lessons in the Student Workbook. You can ask them to do the assignments on their own, or you, as the instructor, can guide them through the lessons. **Either way, they win.** Its better that they know the kinds of dangers and the proper way to keep safe before they do something that might get them hurt.

In **Lesson 1** they learn about safety on walking and working surfaces. Then, in **Lesson 2**, they are introduced to the basics of fire protection and emergency exits. Since they can be assigned a job that requires them to use equipment, **Lesson 3** focuses on the protective guards that are on machinery. They can be exposed to electrical hazards too, so **Lesson 4** steps them through these items.

In **lesson 5** they see the basics of hazard communications terms that they should become familiar with. Their boss can require them to wear certain clothing, gloves, shoes or helmets, so **Lesson 6** helps them understand these kinds of equipment and their use. For their continued safety, **Lesson 7** steps them through the purpose and procedures of tagging and locking certain equipment. And finally, in **Lesson 8** they see how to handle materials safely.

Instructions

As the students step through each of the lessons, they will be asked to complete a Pre-Quiz. These are included at the beginning of each lesson to help them understand the kind of information that is included in the lesson, and to find out how much they already know about the topic. At any time the student is able to save their information by clicking on "Save Test Results."

After you have loaded the program (follow the installation instructions), you will see a screen like this:

Apprenticeship Safety Training Program - [Table Of Contents]

File Lessons Progress

Your Name
Dave

Lesson	Description	% Answered
<input checked="" type="radio"/> Lesson #1	Walking And Working Surfaces	0%
<input type="radio"/> Lesson #2	Means Of Egress/Fire Protection	0%
<input type="radio"/> Lesson #3	Machine Guarding	0%
<input type="radio"/> Lesson #4	Electrical	0%
<input type="radio"/> Lesson #5	Hazard Communication	0%
<input type="radio"/> Lesson #6	Personal Protective Equipment	0%
<input type="radio"/> Lesson #7	Lockout/Tagout	0%
<input type="radio"/> Lesson #8	Materials Handling	0%
Take Lesson Test		0%
		<-- Total % Answered

Instructions
As you take each Lesson Test, you are allowed to skip questions and go back to them later. Once you have answered all questions, you can Submit your test result.

Save Test Results
Print Test Results

APPRENTICESHIP SAFETY TRAINING PROGRAM

Department Of Labor And Industry (DLI)
Division Of Voluntary Apprenticeship

Each student will be asked to log-on with their full name and password each time they wish to access the program. The password is intended to protect all of their saved information. After they have completed all tests, the "Total % Answered" box will display 100%. At that time, they should press "Save Test Results" or the "Print Test Results" button. The answers and a student's password, in case they forget, can be found by accessing "Programs", "Windows Explorer", double-click "C:\OSHA:" and then double-click "Register.txt" and/or "results1.txt". You may then print the results for all students, or individual students.

Remember, students may be allowed to skip questions, go back and change answers, or review parts of the lesson itself, simply by clicking "Save Test Results" at any time. This allows the students to keep track of all of the lesson tests, and their progress, during the school year.

1. Walking and Working Surfaces

Introduction

Slipping, tripping and falling cause most of the injuries at work. More than 15% of these accidents actually cause death. We want our youth to know the reasons that cause these injuries so they can protect themselves. We don't want them to end up in a hospital or even a cemetery.

This lesson introduces our youth to the basics of walking and working surfaces. This includes:

- Housekeeping
- Aisles and passageways
- Covers and guardrails
- Floor loading limits

In addition, they find out how to protect themselves and others from **openings** and **holes** in **floors** and **walls**. This includes **platforms** and **runways**. Since **stairs** also cause accidents, we include a section for these as well. Their job can require that they climb. That's why we have also included a special section for **ladders** and **scaffolding**.

Outcomes

After Lesson 1 the students will be able to recognize potential safety hazards and know how they can bring these problems to their supervisor. They can correct many of the problems themselves to prevent slipping, tripping and falling accidents and injury.

Lesson Summary

This lesson covers general safety in the workplace. This includes housekeeping of aisles and passageways, covers and guardrails, and floor loading protection.

It continues with safety information about floor and wall openings and holes. Details are presented about protection for floor openings, protection of open-sided floors, platforms and runways, stairway railings and guards.

Fixed interior and exterior industrial stairs cover areas around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms or pits. Ladders include portable and fixed types. Safety involving manually propelled mobile ladder stands, scaffolds and other working surfaces are also explained.

Reference Highlights

Some of the most frequently cited violations involve housekeeping.

OSHA standards for guarding openings and holes use the following definitions:

Floor hole. An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement or yard, through which materials but not persons may fall.

Floor opening. An opening measuring at least 12 inches or more in its least dimension, in any floor, platform, pavement or yard, through which persons may fall.

Platform. A working space for persons, elevated above the surrounding floor or ground.

Wall hole. An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition.

Wall opening. An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall.

One of the most frequently cited violations is the requirement that every open-sided floor or platform 4 feet or more above adjacent floor or ground level are guarded by a standard railing (or the equivalent as specified in paragraph (e)(3)) on all open sides, except where there is an entrance to a ramp, stairway, or fixed ladder.

Every runway is guarded by a standard railing (or the equivalent as specified in paragraph (e)(3)) on all sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.

Fixed Industrial Stairs are provided for access to and from places of work where operations necessitate regular travel between levels.

The OSHA standards do not specify any exact number or placement of landings. The National Safety Council recommends landings at every tenth or twelfth tread.

It is important to note some of the general requirements of 1910.28(a) which apply to all scaffolds.

There are a number of scaffold types, and 1910.28 should be reviewed carefully for special requirements that apply to each type.

OSHA standard 1910.29 should be reviewed carefully for specific requirements.

Lesson 1 Test – Walking and Working Surfaces

1. **Slipping, tripping and falling cause most of the injuries at work. What percent of these accidents actually cause death?**
 - a) 10%
 - b) 15%**
 - c) 20%
 - d) 25%
2. **Some of the most frequent reasons for injuries involve housekeeping. Which reason is not housekeeping related?**
 - a) All places where you work, including hallways, storerooms, and service rooms aren't kept clean, orderly and sanitary.
 - b) The floor of every room isn't clean and dry. When liquids are used, there isn't drainage with gratings, mats, or raised platforms.
 - c) All hallways, storerooms, and service rooms where you work don't have adequate lighting.**
 - d) Every floor, working place and passageway doesn't have protruding nails, splinters, holes, or loose boards.
3. **Floor and wall openings, holes, and the open sides of platforms might cause a safety hazard. Which item below is considered the worst safety hazard?**
 - a) Stairs with less than four steps that do not have standard railings or handrails.
 - b) Stairway railings less than 42 inch high.**
 - c) Open-sided platforms less than 4 feet above a floor not guarded by a railing on all open sides.
 - d) A floor hole opening that is 3/4 inch in a floor, platform or pavement.
4. **Fixed industrial stairs are provided for access to and from places where you travel between levels. They are designed to be:**
 - a) At least 20 inch wide.
 - b) Safe enough to carry 2000 pounds.
 - c) Strong enough to carry five times their normal load.**
 - d) At least 8 feet from the edge of the step to the ceiling so you don't bump your head.
5. **If a ladder is not used properly, it can collapse and cause you to:**
 - a) Fall.**
 - b) Get pinched.
 - c) Trip.
 - d) Break your leg.
6. **The proper use of ladders can prevent accidents. Which item below is not a safety tip when using ladders?**
 - a) Ladders are put on a solid surface or are held in position.
 - b) Ladders used to gain access to a roof or other area extend at least 3 feet beyond the top support.
 - c) Short ladders are spliced together to make scaffolds or work platforms.**
 - d) You always face the ladder when climbing up or down

7. A "cage" is a guard that is fastened to the side rails of a fixed ladder or to a structure. Which item below does not clearly state the purpose of a "cage"?
- a) A cage is used to enclose the ladder so you don't fall as you climb.
 - b) Cages protect other employees from falling materials.**
 - c) Cages extend at least 42 inches above the top of a landing, just like stair railings.
 - d) Cages extend down the ladder to 7 or 8 feet above the base of the ladder.
8. There are special safety rules for the use of scaffolds available in buildings and structures. Which real safety rule applies to scaffolds?
- a) Scaffolds can be moved while they are in use or occupied.
 - b) A cage is provided on a scaffold exposed to overhead hazards.
 - c) A safe means is provided to get to the working platform of the scaffold by using a ladder or ramp.**
 - d) You can work on scaffolds during storms or high winds or when they are covered with ice or snow if you are wearing the proper personal protective equipment.
9. There are general safety rules for working with mobile work platforms, ladder stands and rolling or mobile scaffolds and towers. These do not include:
- a) All exposed surfaces of mobile ladder stands and scaffolds are free from sharp edges, burrs, or other safety hazards.
 - b) The maximum work height is less than four times the minimum dimension of the base unless outriggers, guys or braces are added to provide stability.
 - c) This standard rule requires guardrails and toeboards for work levels 10 feet or more above the ground or floor.
 - d) The footings for scaffolds support four times their intended load. Objects such as barrels, boxes, loose brick, or concrete blocks can be used to support scaffolds or planks.**
10. Which of the following statements is not a true statement regarding working surfaces?
- a) Portable dockboard (bridge plates) must be secured in position, either by being anchored or equipped with devices that will prevent their slipping.
 - b) Movement of the dockboard during material handling operations has resulted in forklifts overturning, or falling off the dock.
 - c) Serious injury or death to the driver and damage to equipment and material results from large holes in the work surface.**
 - d) Handholds are provided on portable dockboards to allow safe handling when the dockboard has to be repositioned or relocated.

2. Means of Egress/Fire Protection

Introduction

Lesson 2 deals with something that our youth probably learned in kindergarten. They remember the **fire drills** at school, with their class trying to get the award for following directions, and the older kids liking a break from their classes. In school, the **exit sign** was so familiar that they may not have even noticed it. They also see exit signs in stores, factories, theaters, office buildings, hotels, apartment buildings, practically everywhere. Yet students rarely notice these signs unless they really look for them, even at work.

In this lesson students are introduced to safety in work relating to **fires** and **exits**. This includes:

- Emergency exit safety
- Exit markings and signs
- Lighting and handicap escapes
- Sprinklers, extinguishers and hoses
- Fire detection and alarms
- Emergency exit plans
- Protective equipment

In addition, they find out how to protect themselves and others from **explosions, earthquakes, smoke, toxic vapors, bomb threats, storms and floods**.

Keep in mind that a student's concern should be for the protection of people, not the building.

Outcomes

After lesson 2 students will be able to demonstrate an understanding of the importance of making sure all workers have a safe and easy way of leaving a building in an emergency. Students will learn there are detection devices and other ways to protect themselves from fires and other safety hazards.

Throughout this lesson, the emphasis is on escaping from fires. While this is the main reason for emergency egress from a building, it is not the only reason. Additional hazards that they may face include:

- Explosion
- Earthquake
- Smoke (without fire)
- Toxic vapors
- Bomb threat
- Storms (tornado, hurricane, etc.)
- Flash floods

- Nuclear radiation exposure
- Actions or threatened actions of terrorist groups, mentally ill persons, or political radicals
- Other reasons

Each of these hazards can occur by themselves or in combination with others. Depending on the hazard, the individual involved, the kind of building, and the quality of escape provided, each hazard can become more complex by:

- Panic and confusion
- Poor visibility
- Lack of information or misinformation

Any of the above three conditions often cause more injuries and deaths than the hazard itself. Providing the proper means of egress can allow workers to escape from the main hazard with success.

The safety rules are general and do not deal specifically with specialized buildings or their use.

Lesson Summary

During this lesson students learn the general safety rules giving them the “means of egress” (a way to exit) from buildings. They learn the safe and efficient way to egress (or exit) from buildings. In addition, there are sections on the safety rules for exit markings and signs.

Students will learn about "Means of Egress", the method of escape and evacuation. They also learn about general and specific safety rules and the requirements for providing and marking access to exits, and exit discharge for occupants of buildings.

Lesson 2 deals with safety in work relating to **fires** and **exits**. They include:

- Emergency exit safety
- Exit markings and signs
- Lighting and handicap escapes
- Sprinklers, extinguishers and hoses
- Fire detection and alarms
- Emergency exit plans
- Protective equipment

In addition, they find out how to protect themselves and others from **explosions, earthquakes, smoke, toxic vapors, bomb threats, storms** and **floods**. Each section applies to each of the kinds of disasters, just as they do for fire safety.

This lesson is all about the concern for the protection of people, not the building.

Reference Highlights

The National Fire Protection Association in Massachusetts is used for most local fire codes.

The Life Safety Code was accepted in 1913. It all started with the Committee on Safety to Life, which is part of The National Fire Protection Association.

The Coconut Grove nightclub fire in Boston in 1942, where 492 people died, had national attention on how important exits and fire safety was. The public was even more aware of exits with many hotel fires in 1946. The Building Exits code, after that, was used for creating laws.

In 1966, the code title was changed from "Building Exits Code" to "The Code for Safety to Life from Fire in Buildings and Structures," known as the "Life Safety Code."

There are general requirements imposed by 29 CFR 1910 for providing means of egress from buildings. These include the general requirements that are fundamental to safe and efficient egress from facilities, and detailed requirements to ensure that the qualitative and quantitative factors are properly covered.

The entire Subpart E is promulgated from NFPA 101-1970, Life Safety Code. This is prepared, maintained, and published by the National Fire Protection Association, headquarters in Quincy, Massachusetts.

Since this code is used as the basis for most local fire codes, it is written for general applicability. Keep in mind that your concern is its application primarily for the protection of employees, not the preservation of facilities.

The requirements in Subpart E are general and do not deal specifically with specialized facilities or out of the ordinary uses of the facilities. One major paragraph of Subpart E has been "reserved" for future standards which deal with specific occupancies, the hazards particularly associated with them, and the provisions for necessary means of egress.

For additional information concerning egress capacity and occupancy load refer to the National Fire Protection Association (NFPA) which has specific requirements for individual occupancies.

Although Subpart E is devoted to the provisions for ensuring that personnel can egress from a building under emergency conditions, it also contains several provisions for preventing or reducing risk of such an emergency. Detailed requirements for fire protection are in Subpart L. Subpart E requires that where protection - such as automatic sprinklers, and fire retardant paints - are required and/or installed, they are regularly inspected or tested, maintained, and replenished or renewed as necessary to keep them in good operating condition.

Employers shall establish an employee alarm system that complies with 1910.165. Alarms should be audible or seen by all people in the plant and should have an auxiliary power supply in the event electricity is affected. The alarm should be distinctive and recognizable as a signal to evacuate the work area or perform actions designated under the emergency action plan.

This subpart contains requirements for fire brigades and all portable and fixed fire suppression equipment, fire detection systems, and fire and employee alarm systems installed to meet the fire protection requirements of 29 CFR 1910. It applies to employment other than maritime, construction and agriculture.

The employer shall assure that respiratory protection devices worn by fire brigade members meet the requirements of 1910.134 and the requirements contained in this section. These respirators must also be certified under 30 CFR Part 11.

Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, then only the requirements of this section dealing with inspection, maintenance and testing apply.

The standard does not require the employees to use extinguishers. Where the employer has a total evacuation policy and an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, and extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in Part 1910 requires that a portable extinguisher be provided.

Where the employer has an emergency action plan meeting the requirements of 1910.38 which establishes fire brigades and requires all other employees to evacuate, the employer is exempt from the distribution requirements of this section.

This applies to all fixed extinguishing systems installed to meet a particular OSHA standard except for automatic sprinkler system covered by 1910.159.

Certain paragraphs also apply to fixed system not installed to meet a particular OSHA standard, but which, by their operation, may expose employees to possible injury, death or adverse health consequences caused by the extinguishing agent.

Specific fixed extinguishing systems using dry chemical, gaseous agents, water spray and foam are regulated by 1910.161 through 1910.163.

Except where discharge is immediately recognizable, a distinctive alarm or signaling system which complies with 1910.165 and is capable of being perceived above ambient noise or light levels are provided on all extinguishing systems in those areas covered by the system.

The employer shall provide an emergency action plan per 1910.38 for each area protected by a total flooding system which provides agent concentrations exceeding the maximum safe levels specified in 1910.162(b)(5) and (b)(6).

All systems must have a pre-discharge alarm that complies with 1910.165 and is capable of being perceived above ambient light or noise levels, which will give the employees time to safety exit from the discharge area prior to discharge.

This applies to all fixed systems using dry chemical as the extinguishing agent, installed to meet a particular OSHA standard. These systems must also comply with 1910.160.

When dry chemical discharge may obscure vision, a pre-discharge employee alarm is required which complies with 1910.165 and which will give employees time to safety exit from the discharge area prior to system discharge.

For total flooding systems, a pre-discharge alarm is required on Halon 1211 and carbon dioxide systems with a design concentration of 4 percent or greater and for Halon 1301 systems with a design concentration of 10 percent or greater. The alarm must provide employees' time to safely exit the discharge area prior to system discharge.

This applies to all fixed extinguishing systems, using water or foam solution as the extinguishing agent, installed to meet a particular OSHA standard. These systems must also comply with 1910.160. This section does not apply to automatic sprinkler systems that are covered under 1910.159.

Lesson 2 Test – Means of Egress/Fire Protection

1. **The purpose of fire drills at school is to:**
 - a) Help your class get the award for following directions.
 - b) Let the older kids get a break from their classes.
 - c) Learn emergency exit safety.**
 - d) Learn about Fire Department equipment.
2. **The “means of egress” means:**
 - a) A way to exit from buildings.**
 - b) The way a fire detector warns you of smoke.
 - c) The way to escape from threats of terrorist groups.
 - d) Poor visibility due to toxic chemicals.
3. **Safety rules apply to all buildings, new or old, that are intended for people. Which rule does not apply?**
 - a) Buildings have exits that allow your quick and easy escape in an emergency.
 - b) Exits and safeguards can't depend on any single safeguard only.
 - c) Buildings are designed with locks on doors to protect people from emergencies.**
 - d) Building structures are not allowed to cause danger to people during escape.
4. **A means of egress consists of three separate and distinct parts. Which part does not apply?**
 - a) The ways of exit access.
 - b) The exit sign.**
 - c) The exit.
 - d) The way of exit discharge.
5. **When an exit is protected by separation from other parts of the building, the separation meets all of the following safety rules except which one?**
 - a) Three stories or less have one hour fire resistance.
 - b) Four stories or more have four hour fire resistance.**
 - c) Openings are protected by approved self-closing fire doors.
 - d) Openings in enclosed area exits are limited to access to the enclosed area from normally occupied spaces and for egress from the enclosed area.
6. **The emergency action plan is in writing, except for employers with less than 10 employees. Which item below is not part of an emergency action plan?**
 - a) Escape procedures and escape route assignments.
 - b) Procedure to keep track of all employees.
 - c) Means of reporting fires and emergencies.**
 - d) A floor plan that indicates where all fire detectors and extinguishers are located.
7. **Fire brigades do not apply to which type of emergency?**
 - a) Industrial fire department rescues.
 - b) Private or contractual fire departments.
 - c) Portable fire extinguishing equipment use.**
 - d) Airport crash rescue and forest fire fighting.

8. **Portable fire extinguisher safety rules include all items below except for:**
- a) Extinguishers maintained in a fully charged and operable condition and kept in their designated place.
 - b) Approved extinguishers that are provided for employee use.
 - c) Extinguishers applying to all small hose, Class II and Class III standpipe systems.**
 - d) Extinguishers selected and located based on the classes of potential workplace fires and on the hazard.
9. **Automatic sprinklers provide discharge patterns, densities, and water flow for complete coverage. Which rule below is not true?**
- a) Every automatic sprinkler system has at least one automatic water supply.
 - b) A water supply is capable of providing water flow for at least 30 minutes.
 - c) There must be at least 18 inches between sprinklers and any materials below them.
 - d) All automatic sprinklers are capable of spraying water for a distance of more than 50 feet.**
10. **Fire detectors and fire detection systems are tested and adjusted as often as needed to maintain proper reliability and operating condition. Which statement below is false?**
- a) Servicing, maintenance and testing of fire detection systems must be performed by a trained person knowledgeable in the operations and functions of the system.
 - b) Fire detection equipment installed outdoors must be protected from corrosion and protected from mechanical or physical impact.
 - c) Detection systems installed for an employee alarm and evacuation provide a warning for emergency action and safe escape of employees.
 - d) The employee fire detector is capable of being heard above noise or light levels by all employees in the affected portions of the workplace.**

3. Machine Guarding

Introduction

It is very important to understand machinery and safety in the workplace.

Outcomes

Students will be able to demonstrate an understanding of machinery terms and guarding techniques as they relate to machinery and safety in the workplace.

Lesson Summary

After completing Lesson 3, students will understand machine guarding, including the anchoring of fixed machinery. They will also know the safety rules of woodworking machinery such as machine controls and equipment, and specific machine safety requirements. In addition, they will have an understanding of abrasive wheel machinery, mechanical power presses, and transmissions.

Reference Highlights

It is important to understand how Subpart O applies to machinery in the workplace. Section 212 is a general (or a horizontal) standard that applies to all machines not specifically mentioned elsewhere in others sections of Subpart O. The other sections, specific (vertical) standards, apply to particular types of machines; e.g., Section 213 applies only to woodworking machinery. The remaining paragraphs of Section 213 contain guarding requirements for specific woodworking machines.

Section 1910.216 regulates mills and calenders in the rubber and plastics industries. Due to the specialized nature of these rules, they are beyond the scope of this discussion.

Section 1910.217 deals with mechanical power presses. This is a specialized, complex topic that is beyond the scope of this discussion. However, some basic rules are stated.

All point-of-operation injuries must be reported to OSHA or the State agency within 30 days.

Section 1910.218 regulates forging machines. This is a highly specialized industry and this topic is beyond the scope of this discussion.

Section 1910.219 regulates mechanical power transmission apparatus and refers to all components of the mechanical system that transmit energy from the prime mover (power source) to the part of the machine performing the work.

The intensity of illumination conforms to the requirements of ANSI A11.1-1965 (R1970).

Lesson 3 Test – Machine Guarding

1. Machine guarding is provided to protect you from the safety hazards listed below except for which one:
 - a) Point of operation.
 - b) Adjusting points.**
 - c) Rotating parts.
 - d) Flying chips and sparks.
2. Machines designed for a fixed location are anchored to prevent:
 - a) Walking or moving.**
 - b) Tipping over.
 - c) Vibration.
 - d) Blocking an exit.
3. Each woodworking machine is constructed to provide safety protection. Which item below is not provided?
 - a) Protection from vibration when the largest size tool is mounted and run idle at full speed.
 - b) A mechanical or electrical power control.
 - c) Automatic shut-off controls when a force greater than the machine rating is applied.**
 - d) Protection to prevent the machine from automatically restarting when the power is restored.
4. All woodworking machines, except for which one, are guarded to protect you from safety hazards while operating.
 - a) Table saws.
 - b) Electric staplers.**
 - c) Jointers.
 - d) Lathes.
5. Which of these specific machine safety requirements is false?
 - a) Circular table saws used for ripping have non-kickback fingers or dogs.
 - b) The upper hood of a radial saw is enclosed so that the upper portion of the blade includes the end of the saw arbor.
 - c) Bandsaw wheels are fully open to allow for adjustments and dislodging objects.**
 - d) Each hand-fed jointer with horizontal cutting head is equipped with an automatic guard that covers all the section of the head on the working side of the fence or gage.
6. An abrasive wheel is made up of individual particles that are bounded together to form a wheel. Which of the following safety statements about abrasive wheels is false?
 - a) They do not include wire wheels or buffing wheels.
 - b) If not properly mounted and used an abrasive wheel can actually explode!
 - c) The protecting part of the abrasive wheel safety guard is fixed for the wheel size distance between the wheel and the adjustable tongue.**
 - d) Sections of the wheel can fly out at high speeds and can hit you causing death or serious injury.
7. Before mounting, you must inspect all abrasive wheels to make sure that all of the following safety requirements are met, except for which one?
 - a) They have not been damaged.
 - b) The abrasive wheel is at least ¾ inch in diameter.**
 - c) The spindle of the machine must be checked.
 - d) The machine doesn't exceed the operating speed marked on the wheel.

8. Which basic safety rule about a mechanical power press does not apply?
- a) Point-of-operation guards are provided to prevent hands or fingers to get into the machine by reaching around the guard.
 - b) Guards are provided when an opening is less than ¼ inch.**
 - c) A guard is put over the treadle on foot-operated presses.
 - d) Pedal counterweights on foot-operated presses have the paths of the travel of the weight closed.
9. Which statement about machine presses is false?
- a) Machine presses using full revolution clutches have a single stroke mechanism, except where automatically fed.
 - b) Your employer has regular inspections of power presses to make sure that they are in a safe operating condition, and have a record of inspections and maintenance work.
 - c) A fixed barrier guard always guards the points of operation.**
 - d) All point-of-operation injuries must be reported to OSHA or the State agency within 30 days.
10. Mechanical power transmissions refer to all parts of the mechanical system that transmit energy from the prime mover to the part of the machine doing the work. Which of the following items is not a part of mechanical power transmissions?
- a) Flywheels.
 - b) Pulleys.
 - c) Machine guards.**
 - d) Belts.

4. Electrical

Introduction

Electricity is part of our life, both at home and at work. Engineers and electricians that do wiring, such as overhead lines, cables, or circuit assemblies work with electricity directly. Others, such as office workers and salespeople, work with it indirectly. As a source of power, electricity isn't given much thought for its potential hazards. Since it is a familiar part of our surroundings, it isn't treated with respect.

In 1989, in companies that had 11 or more workers, there were 3,600 work-related deaths. More than 320 of these deaths were the direct result of electrocutions at work. What makes these deaths tragic is that they could have been avoided.

Electricity has long been recognized as a serious workplace hazard, exposing employees to dangers such as electric shock, electrocution, fires and explosions. Our youth need to know about the potential hazards and safety in using electrical equipment and systems.

Electrical safety includes any electrical system that a worker would normally use or contact. The exposed operating parts of electrical systems - lighting equipment, motors, machines, appliances, switches, controls and enclosures - are designed to minimize electrical dangers to them in their workplace.

Outcomes

After completing Lesson 4, students will be able to demonstrate proper application and identification of electrical equipment design safety and disconnecting electrical equipment and circuits. This includes the wiring protection in using and identifying grounded and grounding conductors, equipment connected by cord and plug and non-electrical equipment.

Lesson Summary

Students are introduced to wiring methods, components and equipment for general use. This includes temporary wiring, switches, switchboards and panelboards, conductors for general wiring, flexible cords and cables and equipment for general use.

They will be able to recognize hazardous locations and electrical safety work practices of work for qualified and unqualified persons.

As part of this training, they learn how to select and use appropriate work practices. These include working on or near exposed de-energized parts, lockout and tagging, working on or near exposed energized parts and vehicular and mechanical equipment.

Students will learn safety in using portable electric equipment, electric power and lighting circuits, test instruments and other equipment. Finally, they will recognize the safeguards for personnel protection in the use of protective equipment and alerting techniques.

Reference Highlights

The OSHA electrical standards were based on the National Fire Protection Association's standard NFPA 70E, *Electrical Safety Requirements for Employee Workplaces*, and the NFPA 70 Committee derived Part 1 of their document from the 1978 edition of the *National Electrical Code* (NEC). The standards extracted from the NEC were those considered to most directly apply to employee safety and least likely to change with each new edition of the NEC. OSHA's electrical standards are performance oriented; therefore they contain few direct references to the NEC. However, the NEC contains specific information as to how the required performance can be obtained.

Except as required or permitted elsewhere in this subpart, the dimension of the working space in the direction of access to live parts operating at 600 volts or less and likely to require examination, adjustment, servicing, or maintenance while alive may not be less than indicated in 1910.303(g)(1)(i). In addition, workspace may not be less than 30 inches wide in front of the electrical equipment. Distances are measured from the live parts if they are exposed, or from the enclosure front or opening if the live parts are enclosed. Concrete, brick, or tile walls are considered to be grounded. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

Electrical installations having exposed live parts are accessible to qualified persons only. Sufficient space are provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment. Where energized parts are exposed, the minimum clear workspace may not be less than 3 feet wide (measured vertically from the floor or minimum depth of clear working space in front of electric equipment is given in Table S-2 of 1910.303(h)(3)(i).

Underguarded live parts above working space are maintained at elevations not less than specified in 1910.303(h)(3)(i).

Wiring Design and Protection, section 1910.304 states that a conductor used as a grounded conductor are identifiable and distinguishable from all other conductors. A conductor used as an equipment grounding conductor are identifiable and distinguishable from all other conductors.

For a distribution panelboard, one means by which each conductor's use is identified and made distinguishable from the other circuit conductors is the use of color coding. Acceptable color coding includes the method required by *the National Electrical Code*, Section 210-5. The Code states: "The grounded conductor of a branch circuit are identified by a continuous white or natural gray color." Also, "The equipment grounding conductor of a branch circuit are identified by a continuous green color or a continuous green color with one or more yellow stripes unless it is bare." Bare copper or aluminum wire is permitted for use as a grounding conductor.

The *National Electric Code* specifies the allowable current flow permitted in certain-sized conductors. *Ampacity* is the term used to describe the current-carrying capacity of a conductor. The size of the fuse or circuit breaker required to provide protection is determined by the ampacity of the conductor in the circuit to be protected and the type of load that is on the circuit.

This requirement was extracted from NEC 250-51, *Effective Grounding Path*, which is more complete and fundamental to the understanding of electrical safety.

The National Electrical Manufacturer's Association (NEMA) has standard plug and receptacle connector blade configurations. Each has been developed to standardize the use of plugs and receptacles for different voltages, amperages, and phases from 115 volts through 600, from 15 amperes through 60, and for single- and three-phase systems.

There are several OSHA standards that require the insulation of electrical wiring and equipment in hazardous (classified) locations according to the requirements of Subpart S, Electrical. Most of

these standards are contained in Hazardous Materials. Some examples include Acetylene, Flammable and Combustible Liquids, and Dip Tanks Containing Flammable or Combustible Materials.

The basis for OSHA standard 1910.307 is the *National Electrical Code* (NEC), NFPA 70. A general overview of the guidelines contained in the NEC for installation of electrical wiring and equipment in hazardous (classified) locations can be found in this document under the section entitled "Hazardous Materials."

OSHA's Safety-Related Work Practice standards for general industry, 1910.331-.399, are performance-orientated regulations that complement the existing electrical installation standards. These work-practice standards include requirements for work performed on or near exposed energized and de-energized parts of electrical equipment; use of electrical protective equipment; and the safe use of electrical equipment.

It is important to understand the distinction between these standards and OSHA Standard 1910.147, *Control of Hazardous Energy (Lockout/Tagout)*. The lockout/tagout standard helps safeguard employees from hazardous energy while they are performing servicing or maintenance on machines and equipment. The standard covers electrical energy sources, but it specifically excludes "exposure to electrical hazards from work on, near, or with conductors or equipment in electrical utilization installations," which is covered by Electrical. The lockout/tagout standard does not cover electrical hazards associated with conductors and equipment but only covers that electrical equipment which relates to machinery and equipment that is covered by the lockout standard.

The training requirements apply to employees who face a risk of electric shock that is not reduced to a safe level by the electrical installation requirements of 1910.303-.308.

Employees are trained in and familiar with the safety-related work practices required by 1910.331-.355 that pertain to their respective job assignments.

Employees who are covered by the scope of this standard but who are not qualified persons shall also be trained in and familiar with any electrically related safety practices not specifically addressed by 1910.331-.355 but which are necessary for their safety.

When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in 1910.333©(3)(ii) unless certain insulation requirements are met.

Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed in 1910.304(e), the installation safety requirements for overcurrent protection.

Protective equipment is maintained in a safe, reliable condition and are periodically inspected or tested, as required by 1910.137.

Lesson 4 Test - Electrical

1. **Electrical equipment is designed to protect you from safety hazards that could cause death or serious physical harm. The safety of electrical equipment has the following considerations, except for which one?**
 - a) The use of the electrical equipment for a specific purpose and labeled for that identified purpose.
 - b) The protection for all parts from corrosion.**
 - c) Electrical insulation.
 - d) Arcing effects.
2. **The grounded conductor is an energized circuit conductor that is connected to earth through the system ground. It is commonly referred to as:**
 - a) The root.
 - b) The neutral.**
 - c) The ground fault current connector.
 - d) The negative.
3. **Flexible cords are allowed in what place?**
 - a) Ducts used for dust or flammable vapors.
 - b) Any duct used for ventilation of commercial cooking equipment.
 - c) Connection of portable lamps or appliances.**
 - d) Where run through doorways or windows.
4. **Hazardous locations have a potential for explosion and fire because of all items below except which one?**
 - a) Flammable gasses, vapor or dusts.
 - b) Vaporized cleaning detergents.**
 - c) The presence of easily ignitable fibers.
 - d) From processing chemicals and grains.
5. **Electrical safety work practices are for working near exposed parts of electrical equipment and the safe use of electrical equipment. These include all of the things below except for which one?**
 - a) Using leather gloves for insulation against live parts.**
 - b) Keeping a distance from exposed energized lines.
 - c) Avoiding the use of electric equipment when you or the equipment is wet.
 - d) Locking-out and tagging equipment that is de-energized for maintenance.
6. **Electrical safety-related work practices for qualified and unqualified employees include all of the following areas except for:**
 - a) The installation of temporary wiring during construction.
 - b) Installation in mobile homes and recreational vehicles.**
 - c) Installation in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles.
 - d) The installation of communications equipment.

7. Training is provided for employees who face a risk of electric shock. Employees in certain occupations face this risk and must be trained. Which occupation does not need to be trained?
- a) Electricians.
 - b) Painters.
 - c) Security guards.**
 - d) Welders.
8. Safety-related work practices prevent electric shock or injuries from electrical contacts when work is done near equipment or circuits that can be energized. Which safety rule is false?
- a) Live parts that you can be exposed to must be de-energized before you work on or near them.
 - b) Live parts that are less than 50 volts don't need to be de-energized if there won't be exposure to electrical burns or to explosion due to electric arcs.
 - c) You can work on electric circuit parts or equipment that haven't been de-energized if you are familiar with the proper use of insulating and shielding materials.**
 - d) While you are exposed to contact with parts of electrical equipment or circuits that are de-energized, the circuits energizing the parts must be locked out or tagged.
9. For cord and plug-connected equipment, including extension cords, which statement is false:
- a) Flexible electric extension cords connected to equipment can be used for raising or lowering the equipment.**
 - b) Flexible cords can't be fastened with staples or hung so that they could damage the insulation.
 - c) Attachment plugs, adapters and receptacles can't be connected to prevent equipment grounding.
 - d) Where flammable materials are present only electric equipment capable of igniting them can't be used.
10. Employees working in areas where there are potential electrical hazards must use electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. Which safety rule is false?
- a) Employees must wear non-conductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.
 - b) Employees must wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs, flashes or from flying objects from electrical explosions.
 - c) Protective shields, protective barriers, or insulating materials must be used to protect each employee from shock or burns while working near exposed energized parts.
 - d) Ropes and hand lines used near energized parts must be grounded to protect employees from hand and arm burns.**

5. Hazard Communication

Introduction

There are over 32 million workers exposed to chemical hazards. There are also more than 575,000 existing chemicals and hundreds of new ones every year. This is a serious problem for workers and their employers.

Chemical exposure can cause serious health effects like heart problems, kidney and lung damage, sterility, cancer, burns, and rashes. Some chemicals can be safety hazards and cause fires, explosions and other serious accidents.

Because of these safety and health problems, and because many employers and employees know little about them, the Occupational Safety and Health Administration (OSHA) has a rule called "Hazard Communication." OSHA wants to make sure that our students/workers know about work hazards and how to protect themselves to help reduce chemical illness and injuries.

Chemical manufacturers must provide hazard information to workers and employers with labels or containers and material safety data sheets (MSDS's). These sheets provide hazard information that helps a worker understand safety protection at work.

The Hazard Communication standard is different from other OSHA health rules because it covers all hazardous chemicals.

Outcomes

In Lesson 5 students will be able to demonstrate an understanding of the principles and procedures used in hazard communication. This includes hazard evaluation, written hazard communication programs, labels and warnings. Special attention is made to Material Safety Data Sheets, a list of hazardous chemicals, employee information and training.

Lesson Summary

The Hazard Communication Standard is an explanation of the rules and identify the responsible staff members. This includes the hazardous chemicals identified as part of the Hazard Communication Program. A section on medical emergencies covers special requirements for trade secret chemicals and for non-emergencies.

Special attention is paid to labels and warnings. Students will be able to understand information contained on labels, in regulatory compliance, and on Material Safety Data Sheets.

Finally, a Checklist for Compliance is provided so that they understand the basic safety requirements of hazard communications.

Reference Highlights

Because of the seriousness of these safety and health problems, and because many employers and employees know little or nothing about them, the Occupational Safety and Health Administration (OSHA) has issued a rule called "Hazard Communication." The basic goal of the standard is to be sure employers and employees know about work hazards and how to protect themselves. This should help to reduce the incidence of chemical source illness and injuries.

The Hazard Communication standard is different from other OSHA health rules as it covers all hazardous chemicals. The rule also incorporates a "downstream flow of information," which means that producers of chemicals have the primary responsibility for generating and disseminating information, while users of chemicals must obtain the information and transmit it to their own employees.

Chemicals that are listed in one of the following sources are to be considered hazardous in all cases:

- **29 CFR 1910, Subpart Z, Toxic and Hazardous Substances**, Occupational Safety and Health Administration, (OSHA) and
- **Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment**, American Conference of Governmental Industrial Hygienists (ACGIH).

In addition, chemicals that have been evaluated and found to be a suspect or confined carcinogen in the following sources must be reported as such:

- National Toxicology Program (NTP), **Annual Report on Carcinogens**,
- International Agency for Research on Cancer (IARC), **Monographs**, and
- Regulated by OSHA as a carcinogen.

The written program does not have to be lengthy or complicated, and some employers may be able to rely on existing hazard communication programs to comply with the above requirements. The written program must be available to employees, their designated representatives, the Assistant Secretary of Labor for Occupational Safety and Health, and the Director of the National Institute for Occupational Safety and Health (NIOSH).

A copy of the non-mandatory MSDS form (OSHA 174) can be obtained from OSHA field offices.

A "trade secret" is something that gives an employer an opportunity to obtain an advantage over competitors who do not know about the trade secret or who do not use it. For example, a trade secret may be a confidential device, pattern, information, or chemical make-up. Chemical industry trade secrets are generally formulas, process data, or a "specific chemical identity." The latter is the type of trade secret information referred to the hazard communication standard. The term includes the chemical name, the Chemical Abstracts Services (CAS) Registry Number, or any other specific information that reveals the precise designation. It does not include common names.

The Hazard Communication Standard (HCS) is based on a simple concept - that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring. The HCS is designed to provide employees with the information they need.

The standard is long, and some parts of it are technical, but the basic concepts are simple. In fact, the requirements reflect what many employers have been doing for years. They may find that they are already largely in compliance with many of the provisions, and will simply have to modify their existing programs somewhat. If they are operating in an OSHA-approved State Plan

State, they must comply with the State requirements, which may be different than those of the Federal rule. Many of the State Plan States had hazardous communication or "right-to-know" laws prior to promulgation of the Federal rule. Employers in State Plan States should contact their State OSHA offices for more information regarding applicable requirements.

The requirements of the rule that deal specifically with the hazard communication program are found in the standard in paragraphs (e), written hazard communication programs; (f), labels and other forms of warning; (g), material safety data sheets; and (h), employee information and training. The requirements of these paragraphs should be the focus of your attention. Concentrate on becoming familiar with them, using paragraphs (b), scope and application, and ©, definitions, as references when needed to help explain the provisions.

If OSHA inspects a workplace for compliance with the HCS, the OSHA compliance officer will ask to see the written plan at the outset of the inspection.

The primary information to be obtained from an OSHA-required label is an identity for the material and appropriate hazard warnings. The identity is any term that appears on the label, the MSDS, and the list of chemicals, and thus links these three sources of information. The identity used by the supplier may be a common or trade name ("Black Magic Formula"), or a chemical name (1,1,1,-trichloroethane). The hazard warning is a brief statement of hazardous effects of the chemical ("flammable," "causes lung damage"). Labels frequently contain other information, such as precautionary measures ("do not use near open flame"), but this information is provided voluntarily and is not required by the rule. Labels must be legible, and prominently displayed. There are no specific requirements for size or color, or any specific text.

Employers that are purchasing and using hazardous chemicals - rather than producing or distributing them - will primarily be concerned with ensuring that every purchased container is labeled. If materials are transferred into other containers, the employer must ensure that these are labeled as well, unless they fall under the portable container exemption (paragraph (f)(7)). In terms of labeling systems, they can simply choose to use the labels provided by their suppliers on the containers. These will be generally verbal text labels, and do not usually include numerical rating systems or symbols that require special training. The most important thing to remember is that this is a continuing duty - all in-plant containers of hazardous chemicals must always be labeled. Therefore, it is important to designate someone to be responsible for ensuring that the labels are maintained as required on the containers in a facility, and that newly purchased materials are checked for labels prior to use.

There is no specified format for the MSDS under the rule, although there are specific information requirements. OSHA has developed a non-mandatory format, OSHA Form 174, which may be used by chemical manufacturers and importers to comply with the rule. The MSDS must be in English. Companies are entitled to receive from their supplier a data sheet that includes all of the information required under the rule. If they do not receive one automatically, they should request one. If they receive one that is obviously inadequate, with, for example, blank sources that are not completed, they should request an appropriately completed one. If their request for a data sheet or for a corrected data sheet does not produce the information needed, they should contact their local OSHA Area Office for assistance in obtaining the MSDS.

If they are going to do the training themselves, they will have to understand the material and be prepared to motivate the workers to learn. This is not always an easy task, but the benefits are worth the effort. More information regarding appropriate training can be found in OSHA Publication No. 2254 that contains voluntary training guidelines. A copy of this document is available from OSHA's Publications Office at (202) 523-9667.

The rule does not require them to maintain records of employee training, but many employers choose to do so. This may help them monitor their own program to ensure that all employees are appropriately trained. If they already have a training program, they may simply have to supplement it with whatever additional information is required under the HCS. For example, construction employers that are already in compliance with the construction standard (29 CFR 1926.21) will have little extra training to do.

Lesson 5 Test – Hazard Communication

1. **A written hazard communication program includes hazard information and protective measures for your safety. Which statement is false?**
 - a) A written hazard communication program includes container labeling.
 - b) Material safety data sheets are part of a written hazard communication program.
 - c) A list of hazardous chemicals is found in a written hazard communication program.
 - d) The written hazard communication program is very detailed and complicated.**
2. **Chemical manufacturers provide a Material Safety Data Sheet for each hazardous chemical. What information is not found on an MSDS?**
 - a) Chemical identity of the hazardous and common name.
 - b) Emergency and first aid phone numbers for your company.**
 - c) Physical and chemical characteristics.
 - d) Health effects and exposure limits.
3. **Companies have training and information programs for employees exposed to hazardous chemicals in their work area. This hazardous materials information includes everything below except for what?**
 - a) The hazard communication standard and the requirements.
 - b) Blank MSDS forms for you to identify hazardous chemicals in your work area.**
 - c) The parts of the hazard communication program in your work.
 - d) Operations in work areas where hazardous chemicals are present.
4. **For “trade secret” chemicals in medical emergencies, which statement is true?**
 - a) The chemical manufacturer or your company can explain the specific chemical identity of a hazardous chemical to a doctor.**
 - b) The doctor has the responsibility to determine the chemical equation used to make the chemical.
 - c) Following the MSDS, your company has permission from the chemical manufacturer to release “trade secret” information to health professionals.
 - d) The request for “trade secret” information is in writing and is used to conduct medical experiments with volunteer employees.
5. **The Hazard Communication Standard is based on a need and a right to know the hazards, identities chemicals that you are exposed to and what protective measures are available to prevent injury. Which statement below is false?**
 - a) When your company has information about the chemicals being used, they can take steps to reduce exposures, substitute less hazardous materials, and establish proper work practices.
 - b) Companies that simply use chemicals, rather than produce them, are not required to provide the hazard information to employees.**
 - c) The HCS requires information to be prepared and communicated regarding all hazardous chemicals and covers both physical and health hazards.
 - d) Chemical manufacturers and distributors of hazardous chemicals provide labels and material safety data sheets to the companies where they ship chemicals.
6. **Companies don’t have to have written hazard communication programs and lists of chemicals for which type of operations?**
 - a) Where companies maintain material safety data sheets that they receive and give to you.
 - b) Laboratories where the chemicals are only handled in sealed containers.**
 - c) Where companies only need labels on containers as they are received.
 - d) In companies that provide information and training for you about hazardous chemicals.

7. Your company is required to have a list of hazardous chemicals in the workplace as an inventory of everything where an MSDS must be maintained. Which statement is false?
- a) Chemicals include liquids in containers, solids, gases, vapors, fumes and mists.
 - b) Welding fumes, dusts, and exhaust fumes are all sources of chemical exposures.
 - c) Rubbing alcohol in the first aid kit, drugs and cosmetics that you bring to work are covered.**
 - d) Companies shouldn't allow you to use any chemicals that don't have an MSDS.
8. Containers of hazardous chemicals are labeled, tagged, or marked with the identity of the material. Which statement below is false?
- a) Distributors make sure that every container of hazardous chemicals they ship is labeled with information and the name and address of the producer.
 - b) Companies that purchase chemicals rely on the labels provided by their suppliers.
 - c) If the material is transferred from a labeled container to another container, you remove the label from the container and place it on the portable container.**
 - d) The primary information on a label is an identity of the material and appropriate hazard warnings.
9. Each employee who can be "exposed" to hazardous chemicals when working must be provided information and be trained prior to initial assignment to work with a hazardous chemical. Which statement below is the correct definition of "exposed"?
- a) An employee that moves a hazardous chemical through any route of entry in the workplace.
 - b) An employee that prepares a hazardous materials and chemical list for the written hazardous communication program.
 - c) An employee that has access to the substance-specific information on the labels and MSDS's of hazardous chemicals such as flammable liquids, corrosive materials, and carcinogens.
 - d) An employee that is subject to a hazardous chemical in the course of employment through any route of entry including inhalation, ingestion, skin contact or absorption.**
10. The Checklist for Compliance does not include which item?
- a) Prepared an inventory of chemicals used.
 - b) Notified manufacturer of chemicals used.**
 - c) Ensured containers are labeled.
 - d) Made MSDS's available to workers.

6. Personal Protective Equipment

Introduction

Hard hats, goggles, face shields, steel-toed shoes, respirators, aprons, gloves, and full body suits are all forms of personal protective equipment (PPE).

Personal protective equipment is not a substitute for safety, work practices, or supervision. Personal protective equipment provides our youth with a safe and healthy workplace. Personal protective equipment includes all clothing and other work accessories designed to create protection against hazards. The basic element of a company program for PPE includes standard operating procedures for employees, training on the protective limitations of PPE, and on proper use and maintenance.

Using personal protective equipment means workers have hazard awareness and training. The equipment does not eliminate the hazard. If the equipment fails, a worker is exposed to safety hazards. To reduce the possibility of failure, equipment must be properly fitted and maintained in a clean and usable condition.

Selection of the proper personal protective equipment for a job is important. Workers and employers must understand the equipment's purpose and its limitations. The equipment is not to be altered or removed, even if they think it is uncomfortable. In fact, sometimes equipment can be uncomfortable simply because it does not fit properly.

Outcomes

In Lesson 6, students will be able to identify appropriate personal protective equipment including, but not limited to, employee-owned equipment, hazard assessment and equipment selection.

Lesson Summary

The following will be covered:

Eye and face protection including filter lenses, selection, inspection and maintenance. Respiratory protection including air-purifying devices, atmosphere or air-supplying devices, combination air-purifying and atmosphere-supplying devices are covered to protect the air that they breath.

Proper protection of head, hands, ears and feet is important. Students will learn about protective equipment, selection, fit, inspection and maintenance. Hearing protection includes information about earplugs and earmuffs. There is also information about the care and use of electrical protective devices.

Supervisors recognize hazards and are responsible for their employees' use of personal protective equipment. A safety program for new employees is necessary during an employees orientation program.

Combining the correct personal protective equipment with a good training program gives workers extra safety when other controls are inadequate or impossible.

Personal protective equipment is effective only if the equipment is selected based on its intended use, proper training in its use, and equipment which is properly tested, maintained and worn.

Reference Highlights

Design, construction, tests, and use of eye and face protection purchased prior to July 5, 1994, must be in accordance with ANSI Z87.1-1968 USA *Standard Practice for Occupational and Educational Eye and Face Protection*. Protective eye and face devices purchased after July 5, 1994, must comply with ANSI Z87.1-1989, *American National Standard Practice for Occupational and Educational Eye and Face Protection*.

Supplied-air respirators deliver breathing air through a supply hose connected to the wearer's facepiece or enclosure. The air delivered must be free of contaminants and must be from a source located in the clean air. The OSHA requirements for compressed air used for breathing, including monitoring for carbon monoxide, are listed in 1910.134(d). Supplied-air respirators should only be used in non-IDLH atmospheres.

There are three types of supplied-air respirators: Type A, Type B and Type C. Type A supplied-air respirators are also known as hose masks with blower. A motor-driven or hand-operated blower through a strong, large diameter hose supplies air. Type B supplied-air respirators are hose masks as described above without a blower. The wearer draws air through the hose by breathing. Type C supplied-air respirators are commonly referred to as air-line respirators. An air-line respirator must be supplied with respirable air conforming to Grade D Compressed Gas Association's Standard CGA G-7.1-73, *Commodity Specification for Air*, 1973. This standard requires air to have the oxygen content normally present in the atmosphere, no more than 5 mg/M³ of condensed hydrocarbon contamination, no more than 20 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm of carbon dioxide.

Requirements for a minimal acceptable respirator program are specified in 1910.134(b)(1) through (b)(11).

OSHA standards state that the employer is responsible not only for providing appropriate respirators, but also for developing written standard operating procedures for their selection, use and care. The procedures must include a discussion or explanation of all items specified in 29 CFR 1910.134(b).

The standard states that "approved or accepted respirators are used when they are available." A respirator is approved as the whole unit with specific components. OSHA recognizes a respirator as approved if it has been jointly approved by NIOSH and the Mine Safety and Health Administration (MSHA)

The standards recognized by OSHA for head protection purchased prior to July 5, 1994, are contained in ANSI *Requirements for Industrial Head Protection*, Z89.1-1969, and ANSI *Requirements for Industrial Protective Helmets for Electrical Workers*, Z89.2-1971. These should be consulted for details. The standards for protective helmets purchased after July 5, 1994, are contained in ANSI *Personnel Protection-Protective Headware for Industrial Workers-Requirements*, Z89.1-1986. Later editions of these standards are available and acceptable for use.

For firefighters, head protection must consist of a protective head device with ear flaps and a chin strap that meet the performance, construction, and testing requirements stated in Title 29 CFR, 1910.156(e)(5).

Users are cautioned that if unusual conditions occur (such as higher or lower extreme temperatures than described in the standards), or if there are signs of abuse or mutilation of the helmet or any component, the margin of safety may be reduced. If damage is suspected, helmets should be replaced or representative samples tested in accordance with procedures contained in

ANSI Z89.1-1986. This discussion references national consensus standards, for example, ANSI standards, that were adopted into OSHA regulations. Employers are encouraged to use up-to-date national consensus standards that provide employee protection equal to or greater than that provided by OSHA standards.

Safety footwear is classified according to its ability to meet minimum requirements for both compression and impact tests. These requirements and testing procedures may be found in American National Standards Institute standards. Protective footwear purchased prior to July 5, 1994, must comply with ANSI Z41.1-1967, *USA Standard for Men's Safety-Toe Footwear*. Protective footwear purchased after July 5, 1994, must comply with ANSI Z41-1991, *American National Standard for Personnel Protection-Protective Footwear*.

Lesson 6 Test – Personal Protective Equipment

1. **When you bring your own personal protective equipment to work:**
 - a) You need prior written approval from the company.
 - b) You must wash the equipment in approved detergents before using.
 - c) Your supervisor must check the adequacy and sanitation of the equipment.**
 - d) You are allowed to share your equipment with the other employees.
2. **Personal protective equipment provides you with a safe and healthy workplace against hazards. Which items below are not PPE (personal protective equipment)?**
 - a) Hard hats and respirators.
 - b) Head bands, personal glasses and tennis shoes.**
 - c) Aprons, gloves, coveralls and full body suits.
 - d) Goggles, face shields and steel-toed shoes.
3. **Eye and face protective equipment is provided to protect you from injury to your eyes or face from all items below except for which one?**
 - a) Flying particles and light radiation.
 - b) Sharp metal edges and scratches.**
 - c) Molten metal and liquid chemicals.
 - d) Acids, caustic liquids, gases and vapors.
4. **The lenses of eye protectors must be inspected and maintained. Which statement below is false?**
 - a) Slack, worn-out, sweat-soaked, or twisted headbands don't hold your eye protectors in position.
 - b) Pitted lenses reduce vision. Deep scratches in lenses break easily.
 - c) Continuously looking through dirty lenses can strain your eyes.
 - d) You must clean your eye protectors monthly with a cleaning solution and tissue.**
5. **Respiratory protective devices protect your health. They fall into three classes. Which of the following items is not a class of respiratory protective devices?**
 - a) Air purifying.
 - b) Atmosphere or air supplying.
 - c) Combination atmosphere level de-contaminator.**
 - d) Combination air purifying and supplying.
6. **Most workers who suffer impact injuries to the head were not wearing head protection. Hard hats do not:**
 - a) Resist penetration and absorb the shock of a blow.
 - b) Protect your head from acids and extreme heat.**
 - c) Protect your head from falling or flying objects.
 - d) Protect against electrical shock.
7. **For protection of your feet and legs from falling or rolling objects, sharp objects, molten metal, hot surfaces, and wet slippery surfaces, which item below can catch on something and cause you to trip?**
 - a) Foot guards, safety shoes, boots and leggings.
 - b) Leggings that protect your lower legs and feet.
 - c) Heat-resistant soled and steel-toed shoes.
 - d) Aluminum foot guards worn over work shoes.**

8. Electrical protective devices such as insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber must meet certain requirements. Which item below is not a requirement?
- a) Electrical properties.
 - b) Flame retardant rating.**
 - c) Workmanship.
 - d) Finish.
9. Companies require you to use hand protection when your hands are exposed to hazards. Which statement below is not a hazard for wearing hand protection?
- a) Machine shop equipment such as drill presses.**
 - b) Skin absorption of harmful substances.
 - c) Chemical and thermal burns and harmful temperature extremes.
 - d) Severe abrasions, cuts, lacerations or punctures.
10. Exposure to high noise levels can cause permanent hearing loss or impairment. Glasses, long sideburns, long hair, and facial movements can reduce your protection. Which statement below does not work as protection?
- a) Waxed cotton, foam, or fiberglass wool earplugs.
 - b) Disposable earplugs, used one time and then thrown away.
 - c) Slightly moistened and sterilized plain cotton balls.**
 - d) Earmuffs that make a perfect seal around the ear.

7. Lockout/Tagout

Introduction

In September of 1989, OSHA issued a standard for the Control of Hazardous Energy. This standard helps safeguard our youth from hazardous energy while they are performing service or maintenance on machines and equipment. The standard identifies the practices and procedures necessary to **shut down** and **lock out or tag out machines and equipment**. It requires that they receive training in their role in a lockout/tagout, and that inspections are conducted to maintain the energy control program.

Lockout should always be the preferred method since it is a more reliable means of de-energizing equipment than tagout. The use of lockout devices provides a more secure and more effective means of protecting the worker from the unexpected release of hazardous energy or start-up of machines and equipment.

Before service or maintenance is performed on machinery or equipment, the machinery or equipment must be turned off and disconnected from the energy source, and the energy-isolating device must be either locked or tagged out. Following this rule can eliminate nearly 2% of all workplace deaths and can have a significant impact on worker safety and health in the U.S.

39 million workers are protected by this rule. More than a million workers actually service equipment - like craft workers, machine operators, and laborers – and face the greatest risk. Following this standard will prevent about 122 fatalities, 28,400 lost workday injuries, and 31,900 non-lost workday injuries each year.

Outcomes

In Lesson 7 students will be able to demonstrate proper lockout and tagout. This includes the standard, normal production operation, servicing and maintenance operations and minor servicing tasks.

Lesson Summary

The procedures of locking and tagging equipment are important to a workers safety. Students will learn details about the energy control program, energy control procedure, energy-isolating devices, the requirements for lockout/tagout devices, employee training, inspections, application of controls and lockout/tagout devices, removal of locks and tags, and additional safety requirements.

Finally, a Glossary is provided to define commonly used terms.

Reference Highlights

On September 1, 1989, OSHA issued a final rule on the Control of Hazardous Energy (Lockout/Tagout) in Volume 29 of the *Code of Federal Regulations* (29 CFR), Section 1910.147. This standard, which went into effect on January 2, 1990, helps safeguard employees from hazardous energy while they are performing service or maintenance on machines and equipment. The standard identifies the practices and procedures necessary to shut down and

lock out or tag out machines and equipment, requires that employees receive training in their role in the lockout/tagout program, and mandates that periodic inspections be conducted to maintain or enhance the energy control program.

OSHA recognizes that machines and equipment present many hazardous situations during normal production operations - i.e., whenever machines and equipment are used to perform their usual production function. These production hazards are covered by rules in other General Industry Standards, such as the requirements in Subpart O of Part 1910 for general machines guarding and guarding power transmission apparatus (1910.212 and 1910.219). In certain circumstances, however, some hazards encountered during normal production operation may be covered by the lockout/tagout rule.

The procedure must include the following steps: (1) preparing for shutdown, (2) shutting down the machine(s) or equipment, (3) isolating the machine or equipment from the energy source(s), (4) applying the lockout or tagout device(s), (5) safely releasing all potentially hazardous stored or residual energy, and (6) verifying the isolation of the machine(s) or equipment prior to the start of service or maintenance work.

In addition, before lockout or tagout devices are removed and energy is restored to the machines or equipment, certain steps must be taken to re-energize equipment after service is completed, including: (1) assuring that machines or equipment components are operationally intact; (2) notifying affected employees that lockout or tagout devices are removed from each energy-isolating device by the employee who applied the device. (See sections 6(e) and 6(f) of 29 CFR 1910.147 for specific requirements of this standard.)

Lesson 7 Test – Lockout/Tagout

1. **The standard for the control of hazardous energy helps safeguard you while you are performing maintenance on machines and equipment. The standard identifies the procedures necessary to do all of the things below except for which one?**
 - a) Shut down and lock out or tag out of machines and equipment.
 - b) Training in your role in a lockout/tagout.
 - c) Reducing or eliminating at least 2% of all workplace deaths.**
 - d) Inspections to maintain the energy control program.
2. **The lockout/tagout standard covers the servicing and maintenance of machines and equipment from unexpected start-up or release of stored energy that could cause injury to employees. Which statement is false?**
 - a) When the service must continue to provide energy and shutdown of the system is impractical, you are provided with an alternative type of protection that is equally effective.
 - b) While you are servicing or maintaining cord and plug connected electrical equipment, the safety hazards are controlled by unplugging the equipment from the energy source.
 - c) Even when you are performing service or maintenance tasks that don't expose you to the unexpected release of hazardous energy, this standard applies.**
 - d) You must be in control during hot tap operations involving transmission and distribution systems for gas, steam, water, or petroleum products when they are performed on pressurized pipelines.
3. **If an activity such as lubricating, cleaning, or removing a jam from the production equipment takes place during production, you can be exposed to hazards that aren't part of the production operation itself. You must use lockout/tagout when certain conditions occur. Which condition is false?**
 - a) If you must remove or bypass machine guards or other safety devices, resulting in exposure to hazards at the point of operation.
 - b) When you are doing normal servicing tasks, such as setting equipment up or making significant adjustments to machines, that don't occur during normal production operations, you are not required to lock out or tag out the equipment.**
 - c) If you are required to place any part of your body in contact with the point of operation of the operational machine or piece of equipment.
 - d) If you are required to place any part of your body into a danger zone associated with a machine operating cycle.
4. **Whenever the possibility of unexpected machine or equipment start-up exists or the unexpected release of stored energy could occur and cause injury, what does not need to be done prior to servicing or maintenance.**
 - a) Isolate equipment from its energy sources.
 - b) Make equipment inoperative.
 - c) Measuring the existing stored energy in the equipment.**
 - d) Lock out or tag out the machine equipment.

5. **Energy control procedures are used to control potentially hazardous energy sources whenever you perform activities. These procedures include all steps except for which one?**
- a) Preparing for shutdown and shutting down the machines or equipment.
 - b) Isolating the machine or equipment from the energy sources and applying the lockout or tagout devices.
 - c) Safely releasing all potentially hazardous stored or residual energy and verifying the isolation of the machines or equipment.
 - d) Notifying all affected employees before equipment shutdown and on energizing.**
6. **The primary tool for providing protection is the energy-isolating device. This device guards you against accidental machine or equipment start-up or the unexpected re-energizing of equipment. Which statement about energy-isolating devices is false?**
- a) When a tag is attachment to an isolating means, it isn't to be removed except by the person who applied it, and it is never to be bypassed.
 - b) Tags are warning devices attached to energy-isolating devices and don't provide the physical restraint of a lock.
 - c) Tags must be securely attached to the energy-isolating devices so that they can't be detached accidentally during use.
 - d) If the energy-isolating device is lockable, you can use any method to provide protection that is at least as effective as locks.**
7. **When attached for energy isolating, both lockout and tagout devices are tools that you use to help protect you from hazardous energy. Which statement about a lockout device is false?**
- a) It provides protection by holding the energy-isolating device as a source of potential danger.
 - b) It clearly identifies the person who applies the tag and includes the following: DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, or DO NOT OPERATE.
 - c) It indicates the energy-isolating device, equipment energy source and rate classification being controlled until the tagout device is removed.**
 - d) It is standardized according to color, shape, or size. Tagout devices are also standardized according to print and format.
8. **The procedure for applying energy controls includes specific actions that are done in sequence. Which action is not part of the procedure?**
- a) Notify employees in the work area about the shut down.**
 - b) Shut down the machine or equipment.
 - c) Apply the lockout or tagout device.
 - d) Verify the isolation and de-energizing of the machine or equipment.

9. Before lockout or tagout devices are removed and energy is restored to the machine or equipment, the authorized employee takes certain actions. Which action below is not correct?
- a) Inspect the work area to make sure that non-essential items are removed and that machine or equipment components are intact and cable of operating properly.
 - b) Make sure that only the machine or equipment components are energized prior to the locks and tags removed.**
 - c) Check the area around the machine or equipment to make sure that all employees are safely positioned or removed.
 - d) Notify affected employees immediately after removing locks or tags and before starting equipment or machines.
10. Certain terms are important about energy hazards. Which term should be used in this statement? "Machines and equipment are _____ when they are connected to an energy source or they contain residual or stored energy."
- a) An energy-isolating device.
 - b) Considered a tagout device.
 - c) An energized device.**
 - d) A lockout device.

8. Materials Handling

Introduction

More employees are injured in industry while moving materials than while performing any other single function. In every day operations, they handle, transport, and store materials. This can be done by hand, manually operated materials handling equipment, or power operated equipment.

Outcomes

Lesson 8, the students will be able to identify material handling hazards. Depending on the type of job the students have, they may be exposed to safety risks from some or many of these.

Lesson Summary

Handling materials includes using mechanical equipment, secure storage and good housekeeping.

Rim wheels can cause safety hazards. These can include the various types of wheels/tires, hazards, based on appropriate employee training, the servicing of equipment, and the safe operating procedures for multi-piece and single-piece rim wheels.

When using powered industrial trucks, students will better understand the designations, safety guards, the changing and charging storage batteries, trucks and railroad cars, operating training requirements, truck operations, traveling, loading, operation of the truck and maintenance of industrial trucks.

Other types of equipment include overhead and gantry cranes. The various pieces are described such as cabs, footwalks and ladders, stops, bumpers, rail sweeps and guards. This includes inspection and handling the load.

Crawler locomotive and truck cranes safety information includes inspection, handling the load and operating near electric power lines.

The general requirements for derricks are discussed, including their load ratings, inspection, handling the load and other requirements.

Helicopter safety includes the slings and tag lines, cargo hooks, personal protective equipment, loose gear housekeeping, hooking and unhooking loads, static charge, signal systems, approach distance and communications. Also the safe operating practices and inspection of slings includes alloy steel chain slings, wire rope slings, metal mesh slings, safe operating temperatures and synthetic web slings.

Reference Highlights

In 1984, OSHA amended the safety standard for the servicing of multi-piece rim wheels (29CFR 1910.177) to include requirements for the safe servicing of single-piece rim wheels used on large trucks, trailers, buses, and off-road machines.

Atmospheres or locations throughout the plant must be classified hazardous or non-hazardous prior to the consideration of industrial trucks being used therein. Refer to 1910.178(c)(2) which is a summary table on use of industrial trucks in various locations.

The fixed ladder used as access to a crane must meet the American National Standard Safety Code for Fixed Ladders, ANSI A14.3-1956. Usual conditions concerning the access ladders are: There are no cages provided for ladders over 20 feet in unbroken length, offset platforms are not provided, or the ladders themselves are not maintained in a safe condition.

Any ladder provided on an overhead or gantry crane is permanently and securely fastened in place and also are in compliance with 1910.27 of the standards. Damaged, loose, improperly maintained, or unguarded fixed ladders are common.

Modern cranes must meet or exceed the design specifications of the American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.0-1967. Another similar hazardous condition is the failure to re-install crane runway stops at the ends of the limits of travel of the runway. Conditions that could and have occurred in many overhead crane installations are that the controllers have malfunctioned and become stuck in the open position, and the crane itself has run off the ends of the bridge runway, many times through the building wall.

Pendant control boxes also are clearly marked for identification of functions. Lack of clear labeling is quite common. The hazard is that inexperienced operators or supervisory personnel operating the pendant crane may not know the various functions of the push-button station and cause an unexpected movement of the crane. Only designated personnel are permitted to operate a crane per 1910.179(b)(8).

All modern crawler, locomotive, and truck cranes shall meet the design specifications of the American National Standard Safety Code for Crawler, Locomotive, and Truck Cranes, ANSI B30.5-1968.

Where stability governs lifting performance, load ratings have been established for various types of mounting and are given in 1910.180. A substantial and durable rating chart with clearly legible letters and figures are securely fixed in each crane cab in a location easily visible to the operator while seated at the control station.

All modern derricks shall meet the design specifications of the American National Standard Safety Code for Derricks, ANSI B30.6-1969.

The employer shall instruct the air crew and ground personnel on the signal systems to be used and shall review the systems with the employees before hoisting the load. This applies to both radio and hand signal systems. Hand signals, where used, are to be in conformance with 1910.183.

Alloy steel chain slings shall not be used with loads in excess of the rated capacities prescribed 1910.184. Slings not included in this paragraph are used only in accordance with the manufacturer's recommendations.

Alloy steel chain slings are permanently removed from the service if they are heated above 1000°F. When exposed to service temperatures in excess of 600°F, maximum working load limits permitted in 1910.184 are reduced in accordance with the chain or sling manufacturer's recommendations.

Wire rope slings shall not be used with loads in excess of the rated capacities shown in 1910.184. Slings not included are used only in accordance with the manufacturer's recommendations.

Metal mesh slings shall not be used to lift loads in excess of their rated capacities as prescribed in 1910.184. Slings not included are used only in accordance with the manufacturer's recommendations.

Fiber rope slings shall have a diameter of curvature meeting at least the minimums specified in 1910.184.

Spliced fiber rope slings shall not be used unless they have been spliced in accordance with minimum requirements specified in 1910.184 and with any additional recommendations of the manufacturer.

Lesson 8 Test – Materials Handling

1. **More employees are injured in industry while moving materials than while performing any other single function. Storage areas are kept free from materials that create hazards. Which item is not related to safe materials storage?**
 - a) Tripping.
 - b) Fire.
 - c) Moisture.**
 - d) Pests.
2. **A rim wheel is a component assembly. What item below is not one of the components?**
 - a) The assembly used to hold the tire.
 - b) The part of the air chamber.
 - c) The way of attaching the assembly.
 - d) The vehicle axle.**
3. **The effect of the sudden release of the pressurized air causes accidents involving single-piece and multi-piece rim wheels. Which statement is false?**
 - a) Single-rim wheel accidents occur when the pressurized air contained in the tire is suddenly released, whether by the bead breaking or the bead slipping over the rim flange.
 - b) The severity of the hazard is related to the size of the rim flange and the relationship to the air volume released during separation.**
 - c) The principal hazards involve pressurized air that, once released, can pick up and hurl you across the shop if you are close to the rim wheel and within the trajectory.
 - d) It can propel the rim wheel in any potential path or route that a rim wheel component can travel during an explosive separation.
4. **Workplaces using electrically powered industrial trucks have battery-changing areas for storage batteries. Which statement below is false?**
 - a) Determined by the number of electrically powered industrial trucks, there is a separate changing and charging area required for batteries used in motor vehicles, cars and trucks.**
 - b) Facilities are provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation of air contaminants from gassing batteries.
 - c) Smoking is prohibited in each charging area.
 - d) Precautions are taken to prevent open flames, sparks, or electric arcs in battery charging areas.
5. **Which of the following requirements regarding industrial truck operations is false?**
 - a) No person is allowed to stand or pass under the raised portion of any truck.
 - b) Unauthorized personnel can't ride on powered industrial trucks.
 - c) An attended industrial truck is when the vehicle is idling for more than 15 minutes.**
 - d) When an industrial truck is left unattended, power is shut off, brakes set and wheels are blocked.

6. For overhead and gantry cranes, which statement below is false?
- a) A cab-operated crane is an overhead or gantry crane controlled by an operator in a cab located on the bridge or trolley.
 - b) A footwalk is provided on the drive side along the entire length of the bridge of all cranes having the trolley running on top of the girders.
 - c) Every overhead or gantry crane, where the trolley runs on top of the bridge girder, has stops at either end of the limits of the travel of the trolley.
 - d) A bumper is a break-away rail for immediately stopping a moving crane or trolley when it reaches the end of its permitted travel.**
7. The most significant hazard with cranes is what?
- a) Attaching the load.
 - b) Overloading the load.**
 - c) Moving the load.
 - d) Holding the load.
8. A derrick has a mast held with guys or braces, with or without a boom, and used with a hoisting mechanism and operating ropes. Which statement below is not true?
- a) The hoist rope must be wrapped around the load before attaching to the hook with slings.**
 - b) The load should be secured and balanced in the sling or lifting device before it is lifted more than a few inches.
 - c) If the load must remain suspended for considerable time, a dog, or pawl and ratchet must be used to hold the load.
 - d) Any overhead wire must be considered an energized line until the electrical utility authorities indicate that it is not an energized line.
9. For helicopters, loads must be properly slung and tag lines must be of a length that will not permit their being drawn up into the rotors. Which statement is false?
- a) All electrically operated cargo hooks must have electrical activating devices and equipped with an emergency mechanical control for releasing the load.
 - b) Employees receiving the load must use personal protective equipment that have eye protection, hard hats and chinstraps.
 - c) Loose fitting clothing likely to flap, and be snagged on the hoist lines, can't be worn.
 - d) Static charge on the suspended load is grounded when you touch the suspended load with protective rubber gloves.**
10. Slings are used with material handling equipment for the movement of material by hoisting. Whenever any sling is used, which single practice should be used?
- a) Slings shortened with knots, bolts, or other makeshift devices.
 - b) Slings used in a basket hitch with unbalanced loads.
 - c) Slings padded or protected from the sharp edges of their loads.**
 - d) Hands or fingers put between the sling and its load while the sling is being tightened.

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